

Exhibit III

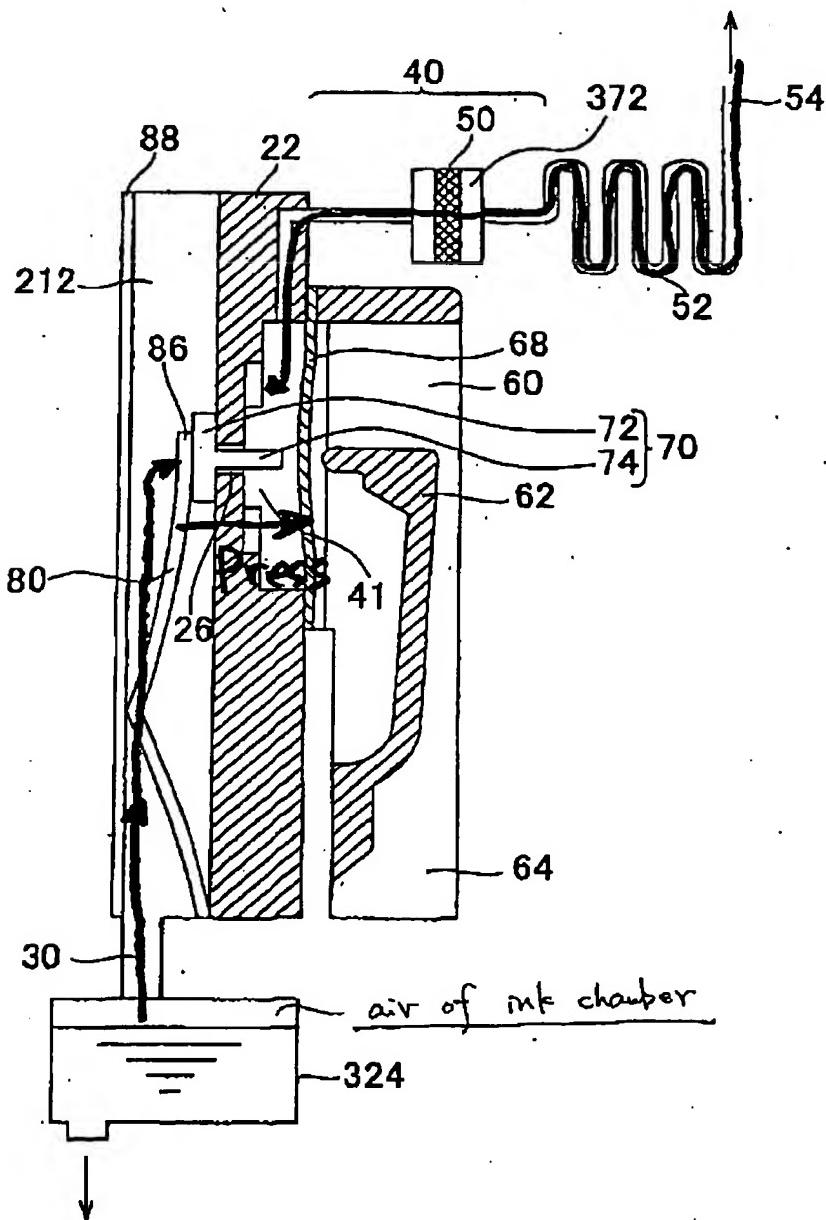
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The present application.

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FIG. 7

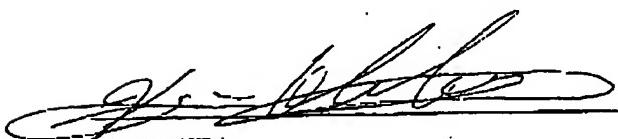
atmosphere



VERIFICATION

The undersigned hereby declares that he/she is conversant with Japanese and English languages and that he/she is the translator of the documents attached and certifies that to the best of his knowledge and belief the attached is a true and correct translation of:

a Japanese Patent Application No. 2002-200589 filed on July 9, 2002.



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December 22, 2004

Date

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JAPANESE PATENT APPLICATION NO.2002-200589

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 [DOCUMENT NAME] Specification ... 1
 [DOCUMENT NAME] Drawings ... 1
 [DOCUMENT NAME] Abstract ... 1
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[DOCUMENT] SPECIFICATION

[TITLE OF THE INVENTION]

INK CARTRIDGE AND PRESSURE-REDUCED PACKAGED INK CARTRIDGE

[WHAT IS CLAIMED IS]

[Claim 1] An ink cartridge comprising:

an ink chamber for holding ink;

an atmosphere passage for conducting atmospheric air to said ink chamber;

an atmosphere open valve, which is provided on said atmosphere passage, for closing said atmosphere passage, when pressed from said ink chamber side;

a pressing part for pressing said atmosphere open valve from said ink chamber side; and

a hammer which is provided in order to open said atmosphere open valve against a pressing force of said pressing part.

[Claim 2] An ink cartridge as claimed in claim 1, wherein said atmosphere passage comprises a passage of a maze shape and a filter, which has air permeability and liquid repellency, in a sequence close to atmospheric air, and

said atmosphere open valve is provided between said filter and said ink chamber.

[Claim 3] An ink cartridge as claimed in claim 1, wherein said pressing part comprises a leaf spring, which presses said atmosphere open valve from said ink chamber side by an elastic force.

[Claim 4] A pressure-reduced packaged ink cartridge comprising an ink cartridge as claimed in one of claim 1 to claim 3 and an external package of a bag shape for covering said ink cartridge, wherein said ink cartridge is sealed by reducing pressure inside said external package.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[Technical Field of the Invention]

This invention relates to an ink cartridge and a pressure-reduced packaged ink cartridge. Particularly, the

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present invention relates to an ink cartridge and a pressure-reduced packaged ink cartridge, which supply ink by being mounted on an inkjet recording apparatus.

[0002]

[Conventional Art]

As a thing, which supplies ink to an inkjet recording apparatus, there's an ink cartridge having an ink chamber that holds ink, so that it can supplies ink to the inkjet recording apparatus via an ink supply hole that is coupled to the ink chamber. This ink cartridge further has an atmosphere passage that conducts the atmospheric air into the ink chamber in order to supply ink from the ink supply hole.

[0003]

[Problems to be Solved by the Invention]

However, since the ink chamber communicates with the external atmosphere through the atmosphere passage, even though the ink cartridge is not mounted on the inkjet recording apparatus, the ink used to leak out from the ink chamber or to dry out.

[0004]

Therefore, it is an object of the present invention to provide an ink cartridge and a pressure-reduced packaged ink cartridge, which can solve the foregoing problems. The above and other objects can be achieved by combinations described in the independent claims. The dependent claims define further advantageous and exemplary combinations of the present invention.

[0005]

[Means for Achieving the Objects]

According to the first aspect of the present invention, an ink cartridge comprises an ink chamber for holding ink, an atmosphere passage for conducting atmospheric air to the ink chamber, an atmosphere open valve, which is provided on the atmosphere passage, for closing the atmosphere passage, when pressed from the ink chamber side, a pressing part for pressing the atmosphere open valve from the ink chamber side and a hammer

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which is provided in order to open the atmosphere open valve against a pressing force of the pressing part.

[0006]

In the ink cartridge, the atmosphere passage may comprise a passage of a maze shape and a filter, which has air permeability and liquid repellency, in a sequence close to atmospheric air, and the atmosphere open valve may be provided between the filter and the ink chamber.

[0007]

In the ink cartridge, the pressing part may comprise a leaf spring, which presses the atmosphere open valve from the ink chamber side by an elastic force.

[0008]

According to the second aspect of the present invention, a pressure-reduced packaged ink cartridge comprises the ink cartridge above and an external package of a bag shape for covering the ink cartridge, wherein the ink cartridge is sealed by reducing pressure inside the external package.

[0009]

The summary of the invention does not necessarily describe all necessary features of the present invention. The present invention may also be a sub-combination of the features described above.

[0010]

[Embodiments of the Invention]

Hereinafter, the invention will now be described based on the preferred embodiments, which do not intend to limit the scope of the present invention, but exemplify the invention. All of the features and the combinations thereof described in the embodiment are not necessarily essential to the invention.

[0011]

Fig. 1 is a front perspective view of an ink cartridge relating to the present invention. Fig. 2 is a rear perspective view of the ink cartridge in Fig. 1. The object of the ink cartridge of the present example is to prevent the ink in an ink chamber

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from leaking out or from drying out by blocking an atmosphere passage, when the ink cartridge is not mounted on an inkjet recording apparatus, while supplying ink to the inkjet recording apparatus by allowing the ink chamber to communicate with the external atmosphere through the atmosphere passage, when the ink cartridge is mounted on the inkjet recording apparatus. Further, the object of the ink cartridge of the present example is to surely block the atmosphere passage.

[0012]

The ink cartridge 10 of the present example has an ink chamber 12, which contains ink therein. The ink chamber 12 has an ink chamber body 15, which is formed as a unified body made of, for example, Polypropylene (PP) and opens at its one side, and a lid 13 that seals the opening of the ink chamber body 15 by for example vibration welding. In the ink chamber 12, a differential pressure means is provided to hold ink and supply the ink to the inkjet recording apparatus responding to its need. However, not limited to this, the ink may be held by sealing a porous material inside the ink chamber 12.

[0013]

The ink cartridge 10 further has an ink supply hole 14, into which an ink supply needle of the inkjet recording apparatus is inserted and the ink contained in the ink chamber 12 is supplied to the inkjet recording apparatus.

[0014]

Near the ink supply hole 14 and besides in the center of the ink chamber 12, a slit part 16 is provided to extend in the insertion direction of the ink supply needle from the ink supply hole 14 of the ink chamber 12. Due to this slit part 16, when the ink supply needle is inserted into the ink cartridge 10, the opening surface of the ink supply hole 14 is controlled to be perpendicular to the ink supply needle before the ink supply hole 14 reaches the ink supply needle, so that the ink supply needle surely approaches the ink supply hole 14. At the upper parts of the sides of the ink chamber 12, first and second locking

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members 18 and 19 are formed to be unified with the ink chamber 12 in order to engage a carriage of the inkjet recording apparatus respectively.

[0015]

The ink cartridge 10 further has an atmosphere passage that conducts the atmospheric air into the ink chamber 12. This atmosphere passage, as described below, has an ink side passage 30, which communicates with the ink chamber 12, and an atmosphere side passage 40, which communicates with the atmospheric air.

[0016]

The ink cartridge 10 further has a communicating part 20, in which a part of the atmosphere passage is formed, a hammer 62 and a discrimination member 60 that has a groove part for discriminating cartridges.

[0017]

Fig. 3 is an exploded perspective view of the ink cartridge 10. The communicating part 20 has a communicating part body 22, which is provided to be unified with the ink chamber body 15. In the communicating part body 22, an in-and-out communicating hole 26 is provided to penetrate the front face though the rear face of the communicating part body 22 in the drawing. The communicating part body 22 and the ink chamber body 15 are provided with the ink side passage 30 that communicates with the ink chamber 12 and the in-and-out communicating hole 26, and the atmosphere side passage 40 that communicates with the in-and-out communicating hole 26 and the atmospheric air.

[0018]

The atmosphere side passage 40 has an opening 54, which opens towards the atmospheric air, a passage 52, of which one end communicates with this opening 54 and a filter 50, which is coupled to the other end of the passage 52 and has air permeability and liquid repellency. The filter 50 prevents the ink in the ink chamber 12 from leaking out. In addition, the filter 50 prevents the dew-condensation moisture from the external atmosphere being mixed into the ink chamber 12. At the

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side face of the front side of the ink chamber body 15 in the drawing, a film 80 is attached not allowing air to penetrate in order to cover the passage 52 and the filter 50 of the atmosphere side passage 40.

[0019]

The ink cartridge 10 has an atmosphere open valve 70 that closes the atmosphere passage when pressed from the side of the ink chamber 12 on the atmosphere passage. The atmosphere open valve 70 has a base 72, of which the cross-sectional area is larger than the in-and-out communicating hole 26 of the communicating part 20, and a projection 74 of which the diameter is smaller than the in-and-out communicating hole 26, extending from this base 72. The projection 74 of the atmosphere open valve 70 is inserted into the in-and-out communicating hole 26 of the communicating part 20 from the rear side in the drawing.

[0020]

The ink cartridge 10 has a pressing part 80 that presses the atmosphere open valve 70 from the ink chamber 12. As an example of the pressing part 80, a leaf spring, which presses the atmosphere open valve 70 from the ink chamber 12 by the elastic force, is shown in the drawing. Moreover, the pressing part 80 is not limited to the leaf spring, and it may be, for example, a coil spring or a resin elastic body. The pressing part 80 has a body part 82 in the shape of a plate with bending and a fixing part 84 that is fixed to the communicating part body 22. The pressing part 80 presses the atmosphere open valve 70 to the position at which the external atmosphere and the inside of the ink chamber 12 do not communicate with each other, at one end 86 of the opposite side against the place where the fixing part 84 is provided. Due to this, since the external atmosphere and the inside of the ink chamber 12 do not communicate with each other in the usual state, when the ink cartridge 10 is not mounted on the inkjet recording apparatus, it is possible to prevent the ink leaking out from the ink chamber 12 or to prevent the moisture of the ink held in the ink chamber 12 evaporating.

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[0021]

At the rear side of the communicating part 20, a film 88 is attached not allowing air to penetrate in order to cover the communicating part 20, the atmosphere open valve 70 and the pressing part 80 of the rear side in the drawing.

[0022]

The ink cartridge 10 has a discrimination member 60 that is mounted on the communicating part 20 from the front side in the drawing. The discrimination member 60 has a base 66, an engaging part 67 that projects from the base 66 and engages the communicating part body 22 of the communicating part 20, a groove part 64 with which a part of the carriage of the recording apparatus is engaged and a hammer 62 that is provided at the groove part 64 and has the force of restitution. When the discrimination member 60 is mounted on the communicating part 20, the hammer 62 of the discrimination member 60 is arranged at the position that faces the projection 74 of the atmosphere open valve 70.

[0023]

The ink cartridge 10 has a seal member 68 that is provided between the projection 74 of the atmosphere open valve 70 and discrimination member 60 and makes a part of the communicating part 20 impenetrable by air. As an example of the seal member 68, there's a film that is made of Polypropylene.

[0024]

Fig. 4 is a plan view that shows the front face of the ink chamber body 15 in regard to Fig. 3, and Fig. 5 is a rear view that shows the rear side thereof. Hereinafter, for purposes of description, Fig. 4 is referred to as the front side of the ink chamber body 15 and Fig. 5 is referred to as the rear side. Referring to these drawings, the ink side passage 30 and the atmosphere side passage 40 will be described.

[0025]

The ink side passage 30 is provided at the upper face of the ink containing part 90, which contains ink, and has a passage 31 of which one end communicates with the ink containing part

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90. The other end of the passage 31 communicates with a communicating hole 33 via a groove 32. The communicating hole 33 penetrates from the rear side to the front side of the ink chamber body 15 and communicates with a communicating hole 35 via a groove 34. The communicating hole 35 penetrates from the rear side to the front side of the communicating part body 22 and reaches the rear side of the in-and-out communicating hole 26 via concave part 36. These passage 31, communicating holes 33 and 35, grooves 32 and 34 and concave part 36 form the ink side passage 30 that communicates with the ink chamber 12 and the in-and-out communicating hole 26. Due to drawing around this ink side passage 30, even when handling the ink cartridge 10, it is possible to prevent the ink leaking out from the inside of the ink chamber 12 to the in-and-out communicating hole 26.

[0026]

Meanwhile, as the atmosphere side passage 40, the front side of the in-and-out communicating hole 26 communicates with a communicating hole 42 via a groove 41. The communicating hole 42 penetrates from the body side of the communicating part body 22 to the rear side of the ink chamber body 15 and communicates with a communicating hole 44 via a groove 43. This communicating hole 44 penetrates from the rear side to the front side of the ink chamber body 15 and communicates with a communicating hole 46 via a groove 45. The communicating hole 46 penetrates from the front side to the rear side of the ink chamber body 15 and communicates with a communicating hole 48 via a groove 47. The communicating hole 48 penetrates from the rear side to the front side of the ink chamber body 15 and is coupled to one face of the filter 50. The other face of the filter 50 is coupled to one end of the passage 52 that is provided in the shape of a maze. The other end of the passage 52 is coupled to the opening 54 that opens towards the atmospheric air. These communicating holes 42, 44, 46 and 48, grooves 41, 43, 45 and 47, filter 50, passage 52 and opening 54 form the atmosphere side passage 40 that communicates with the in-and-out communicating hole 26 and

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the atmospheric air. Due to drawing around this atmosphere side passage 40, it is possible to prevent extraneous substances from the opening 54 or due condensation in the atmosphere side passage 40 from approaching the in-and-out communicating hole 26.

[0027]

Fig. 6 is a partially cross-sectional view of the circumference of the communicating part 20, depicting the operation of the ink cartridge 10. In addition, for purposes of description, the ink chamber 12, the ink side passage 30 and the atmosphere side passage 40 is briefly shown.

[0028]

As shown in Fig. 6, when the ink cartridge 10 is not mounted or is being mounted on the inkjet recording apparatus, the hammer 62 of the discrimination member 60 is positioned to be apart from the film 68 by only a paper-thin margin or to be nearly in contact with it as an initial position. Due to this, the atmosphere open valve 70, which is pressed by the one end 86 of the pressing part 80, blocks the in-and-out communicating hole 26 by its base 74 from the side of the ink chamber 12, namely, the left side of the communicating part body 22 in the drawing. Consequently, since the inside of the ink chamber 12 does not communicate with the external atmosphere and the air cannot be introduced, it is possible to prevent the ink leaking out unnecessarily from the ink supply hole 14.

[0029]

Fig. 7 is a partially cross-sectional view of the circumference of the communicating part 20, depicting the operation of the ink cartridge 10 when mounted on the inkjet recording apparatus. When the ink cartridge 10 is mounted on the inkjet recording apparatus, an engaging piece 69, which is provided in the inkjet recording apparatus, approaches the groove 64 of the discrimination member 60 and presses the hammer 62 towards the film 68. The hammer 62, which is pressed, forces the film 68 to be in elastic deformation and besides changes the position of the atmosphere open valve 70 against the pressing

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force of the pressing part 80 to the left in the drawing. Due to this, the front and rear of the in-and-out communicating hole 26 penetrates and the inside of the ink chamber 12 communicates with the external atmosphere through this in-and-out communicating hole 26. Consequently, it is possible to introduce ink into the ink chamber 12 and to supply ink to the inkjet recording apparatus through the ink supply needle from the ink supply hole 14.

[0030]

Fig. 8 is a perspective view that shows the initial state of a pressure-reduced package of a pressure-reduced packaged ink cartridge. The pressure-reduced packaged ink cartridge 150 has an ink cartridge 10 and an external package 160. The ink cartridge 10 will not be described because it has already been discussed. In addition, the ink cartridge 10 to be packaged may be filled with ink at the time of manufacturing or may be refilled with ink after use.

[0031]

The external package 160 is a bag shape of an approximate square column that includes an opening, which opens at its one side, and a seal part 164, which is sealed at its other side, before the ink cartridge 10 is inserted. In the present example, the external package 160 is made of a material that has a well airproof characteristic such as Aluminum. The external package 160 is held in order that the opening 162 can be positioned in the upper direction in the present example.

[0032]

In Fig. 8, the ink cartridge 10 is arranged to be upside down in regard to Fig. 1 in order that the ink supply hole 14 can face an upward direction. At this state, the ink cartridge 10 is inserted into the external package 160 from the opening 162 of the external package 160.

[0033]

Then, the pressure inside the external package 160, into which the ink cartridge 10 is inserted, is reduced. In the present

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example, the external package 160, into which the ink cartridge 10 is inserted, are set in a pressure reducing apparatus in the state where the ink cartridge 10 is inserted into the external package 160, and the pressure is reduced by exhausting the air from the opening 162 of the external package 160.

[0034]

Fig. 9 is a perspective view that shows the state where the opening 162 of the external package 160 of the pressure-reduced packaged ink cartridge 150 is sealed. The opening 162 of the external package 160 is sealed in the state where the pressure inside the external package 160, into which the ink cartridge 10 is inserted, is reduced. In the present example, the opening 162 is sealed by, for example, thermo compression bonding.

[0035]

After sealing, since the external package 160, into which the ink cartridge 10 is inserted, is taken out of the pressure reducing apparatus, pressure difference between the inside and outside of the external package 160 occurs. Therefore, the external package 160 is contracted, and the ink cartridge 10 is sealed in the external package 160 in the pressure-reduced state.

[0036]

Since the pressure inside the external package 160 is reduced, the air is absorbed in the ink cartridge 10, which has been pressure-reduced and packaged in that way, via the opening 54 from the atmosphere side passage 40. That is, the negative pressure by the external pressure reduction works inside the atmosphere side passage 40, so that a force is applied on the atmosphere open valve 70 in the direction of the atmosphere side passage 40, namely, to the right in Fig. 6.

[0037]

Here, let us assume that the atmosphere passage of the pressure-reduced packaged ink cartridge is closed because the pressing part 80 presses the atmosphere open valve 70 from the

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side of the atmosphere side passage 40 (from the right to the left in Fig. 6), while the atmosphere open valve 70 is inserted into the in-and-out communicating hole 26 from the side of the atmosphere side passage 40 (to the right in Fig. 6). In this case, the atmosphere open valve 70 is forced in the direction to open the in-and-out communicating hole 26 by the negative pressure that is caused by the pressure reduction inside the external package 150. Therefore, in this case, it is necessary to increase the pressing force of the pressing part 80 by that much in advance in order that the ink cannot leak out because the atmosphere open valve 70 is opened by the above negative pressure.

[0038]

Meanwhile, in the ink cartridge 10 of the present example, the pressing part 80 presses the atmosphere open valve 70 from the side of the ink chamber side passage 30 (from the left to the right in Fig. 6); while the atmosphere open valve 70 is inserted into the in-and-out communicating hole 26 from the side of the ink chamber side passage 30 (to the left in Fig. 6). Therefore, in the present example, the atmosphere open valve 70 is forced in the direction to block the in-and-out communicating hole 26 by the negative pressure that is caused by the pressure reduction inside the external package 150.

[0039]

Consequently, according to the present invention unlike the above case, it is unnecessary to increase the pressing force of the pressing part 80 by that much in advance in order that the ink cannot leak out because the atmosphere open valve 70 is opened by the above negative pressure. Particularly, even if the pressing part is a spring such as a leaf spring, it is possible to prevent a creep from occurring in the direction to weaken the pressing force, which is applied on the atmosphere open valve 70 by a force that caused by the negative pressure. Rather, during pressure-reduced packaging, it is possible to more surely close the atmosphere passage because the atmosphere

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open valve 70 is forced by the negative pressure. Further, since the pressing force, which presses the atmosphere open valve 70, can be made small, it is possible to cut down the cost by simplifying mechanisms of the pressing part such as the leaf spring. Accordingly, it is possible to prevent the ink from leaking out or from drying out by surely closing the atmosphere passage, when the ink cartridge is not mounted on the inkjet recording apparatus.

[0040]

Although the present invention has been described by way of an exemplary embodiment, it should be understood that those skilled in the art might make many changes and substitutions without departing from the spirit and the scope of the present invention, which is defined only by the appended claims.

[0041]

[Effects of the Invention]

As obvious from the description above, according to the present invention, it is possible to prevent the ink from leaking out or from drying out by surely closing the atmosphere passage, when the ink cartridge is not mounted on the inkjet recording apparatus.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[Fig. 1]

A front perspective view of an ink cartridge relating to the present invention.

[Fig. 2]

A rear perspective view of the ink cartridge in Fig. 1.

[Fig. 3]

An exploded perspective view of the ink cartridge.

[Fig. 4]

A plan view that shows the front face of the ink chamber in regard to Fig. 3.

[Fig. 5]

A rear view that shows the rear face of the ink chamber in regard to Fig. 3.

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[Fig. 6]

A partially cross-sectional view of the circumference of the communicating part, depicting the operation of the ink cartridge.

[Fig. 7]

A partially cross-sectional view of the circumference of the communicating part, depicting the operation of the ink cartridge when mounted on the inkjet recording apparatus.

[Fig. 8]

A perspective view that shows the initial state of a pressure-reduced package of a pressure-reduced packaged ink cartridge.

[Fig. 9]

A perspective view that shows the state where the opening of the external package of the pressure-reduced packaged ink cartridge is sealed.

[Reference Numerals]

- 10 ink cartridge
- 12 ink chamber
- 20 communicating part
- 30 ink chamber side passage
- 40 atmosphere side passage
- 50 filter
- 60 discrimination member
- 70 atmosphere open valve
- 150 pressure-reduced packaged ink cartridge
- 160 external package

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[DOCUMENT] ABSTRACT

[ABSTRACT]

[OBJECT]

It is to prevent ink from leaking out or from drying out by surely closing an atmosphere passage, when an ink cartridge is not mounted on an inkjet recording apparatus.

[MEANS FOR ACHIEVING THE OBJECT]

It is to have an ink chamber 12 for holding ink, atmosphere passages 30 and 40 for conducting the atmospheric air to the ink chamber 12, an atmosphere open valve 70, which is provided on the atmosphere passages, for closing the atmosphere passages, when pressed from the ink chamber side, a pressing part 80 for pressing the atmosphere open valve 70 from the ink chamber side and a hammer 62 which is provided in order to open the atmosphere open valve 70 against a pressing force of the pressing part 80.

[SELECTED FIGURE] Fig. 6

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